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ABSTRACT

A study of the dynamic organization of content through the sequence of communication behaviors in the classroom attempted to 1) systematically analyze observed and classified communication behaviors of teachers and students in the classroom which relate to content; 2) display the data thus generated so that elements, sequences, and organizations of communication behaviors related to content development can be studied and analyzed; and 3) extrapolate prototypes of content development from the analysis of elements, relationships, and organizing principles of content communication behaviors. Twelve junior high school teachers and their students were observed and video-taped as they engaged in teaching and learning activities in the four subject areas of science, mathematics, social studies, and English. Tapes of 34 class sessions were classified and codified using the 12-category Content Analysis System (developed and refined from a basic scheme of five categories: background, naming, defining, examples, and amplification). Analysis of data consisted of a classification of elements of content communication and the identification of larger and larger sequences of communication behaviors within which these content elements were found. Analysis of elements and larger sequences of data was made of the sample as a whole and within the sample according to subject area and according to individual teachers. (Summary findings are presented and the category system is included.) (JS)

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THE ANALYSIS AND IDENTIFICATION OF CONTENT DEVELOPMENT PATTERNS IN CLASSROOM COMMUNICATION

Introduction

This study was undertaken to determine how subject matter content becomes organized through the sequence of communication behaviors of the teacher and students in the classroom setting. Communication behaviors of the teacher and students of both verbal and non-verbal character are focused upon some aspect of an area of knowledge or subject matter a large percent of class time. This attention to subject matter content is a widely accepted activity of the classroom.

It is assumed that the development or organization of subject matter through communication behaviors in the classroom is influenced by the intent and the planning for classroom activities, by the process of communication as it occurs in the classroom, and by the processes of perception and cognition of individuals in the setting. The intent and the pre-planning of the class session perhaps establishes parameters of the topic and affects the content of communication behaviors. The dynamic and sequential nature of communication behaviors also affects the developing organization of content. Thinking processes incited by the communication process may effect communication behaviors which feed-back and further influence content development in the classroom.

Efforts by Smith and others (3*; 10) to study the logical structure of teaching and learning and by Taba and others (11) to deal with the relationships between teaching behaviors and cognitive thinking levels provide insight into the teaching and learning of subject matter content.

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*Numbers within parentheses refer to references in the Bibliography.

This study, from a somewhat different perspective, may provide further insight into the communication of subject matter content in the classroom.

Problem

This study was concerned with the nature of the dynamic organization of content through the sequence of communication behaviors in the classroom. It was the purpose of the study to:

(1) systematically analyze observed and classified communication behaviors of teachers and students in the classroom which relate to content.

(2) display the data thus generated so that elements, sequences, and organizations of communication behaviors related to content development can be studied and analyzed.

(3) extrapolate prototypes of content development from the analysis of elements, relationships, and organizing principles of content communication behaviors.

Procedure

Twelve junior high school teachers and their students were observed and video-taped as they engaged in teaching and learning activities in the four subject areas of science, mathematics, social studies, and English. A total of thirty-four class sessions, each of approximately forty minutes duration were video-taped.

The communication behaviors observed in these tapes were classified and codified at three-second intervals using the procedures, categories, and ground rules of the Content Analysis System. A summary of the twelve categories of the Content Analysis System is found in Appendix A.

This system was developed and refined from a basic scheme of five categories, Background, Naming, Defining, Examples, and Amplification, first used and tested by James K. Duncan and John B. Hough in the Spring of 1966 at The Ohio State University. The classification System was proposed as a result of formulations from the figure-ground principle from perceptual psychology, the idea of exemplars as developed by Bruner, et al. (6), and some general knowledge notions about the communication process.

The approximately 30,000 three-second interval codifications constituted the data sample in this study. Fifty-two different topics, also called "content figures," were identified in the thirty-four videotapes. The three-second interval data for each of the topics were converted to fortran and processed by a computer program which generated fifty-two 12 x 12 data matrices.

This 12 x 12 matrix display form was generated in a similar way to those matrix forms used in the Flanders' Interaction Analysis System. (1) The total amounts of category data as well as the overall sequence patterns in the data were preserved by this type of display form. By means of the computer program, percentage matrices were also generated. In these forms each cell showed a percent of the total rather than an actual count of the data.

Eight different display forms were used or developed to aid in the analysis of content development. These forms were columns of data as first codified, columns of diads or sequence pairs of content data, 12 x 12 data matrices, percentage matrices, substance matrices, transition matrices, sub-matrices, recording graphs, and matrix models. Examples of the data matrix, the sub-matrix, the matrix model, and the recording graph are found in Appendix B.

Substance and transition matrices are variations of the data matrix. A substance matrix shows only the amount of time in each of the twelve categories used during a content development sequence. A transition matrix shows only the number of shifts from each category to another category. Sub-matrices are a display of a short sequence of data. Recording graphs are a display of the content development data on a horizontal graph. This form can display the detail of specific sequences in content development as well as show overall patterns.

The analysis of data in this study consisted of a classification of elements of content communication and the identification of larger and larger sequences of communication behaviors within which these content elements were found. The elements to be considered were limited to the twelve categories of the Content Analysis System. Each element was defined as the communication behavior classified within a single category throughout its time duration until it is terminated by a shift or interruption by a behavior of a different category. An element, therefore, might be a few seconds in duration to as long as several minutes.

The next larger unit of analysis was the diad or pair of elements found in sequence in the sample data. The nature of each element of the diad as well as the relationship between the elements was the focus of this analysis. The next larger sequence identified was the sub-matrix sequence. The sub-matrix sequence was made up of three or more elements of communication behavior which begin and end with the same element. An example of the sub-matrix sequence illustrated in Appendix B is a miscellaneous cateogry element followed by a naming element followed by a return to the miscellaneous category.

The largest sequence of data analyzed was the 12 x 12 matrix of an entire topic development sequence. Such a matrix is a composite of many sub-matrix sequences. Other useful display forms at this level of analysis were the recording graph and the matrix model.

The analysis of elements and larger sequences of data was made of the sample as a whole and within the sample according to subject area and according to individual teachers.

Findings

From this analysis of data about classroom communication behaviors, findings related to elements, organizations of elements, and patterns of content development are presented. These findings are abstracted from the content analysis data of all fifty-two content figures. Summary findings from content analysis data within the sample by subject area and teacher are also included.

Elements. TABLE I, "USE OF ELEMENTS IN CONTENT DEVELOPMENT," presents a composite of all elements found in the sample of data. Miscellaneous, Abstract Example, Amplification, and Background elements are the most numerous types found in classroom communication behaviors. These elements appear to some extent in most of the fifty-two content figures. Digression elements also appear in most content figures. Naming elements, though only seventy-two were found in the entire sample, appear in a majority of the fifty-two content figures. Defining elements are almost as numerous as the above categories but less widely distributed in the content figures.

Less numerous and less widely used are elements of the categories, General Example, Concrete, Personal, and Negative Examples and the vivid

TABLE I

USE OF ELEMENTS IN CONTENT DEVELOPMENT

Category	Number of Elements in Total Sample	Mean Time of Element in Seconds	Number of Content Figures in Which Element was Found
Background	302	20.4	45/52
Naming	75	6.3	40/52
Defining	209	13.8	33/52
General Example	217	17.1	23/52
Abstract Example	710	26.1	47/52
Concrete Example	126	35.7	14/52
Personal Example	46	16.5	15/52
Negative Example	27	13.8	12/52
Amplification	710	14.4	49/52
Digression	259	19.2	43/52
Vivid	51	4.2	17/52
Miscellaneous	732	18.6	52/52

category. These less used and less widely distributed categories appear to have a relationship to subject areas and individual teachers. This will be discussed under findings with regard to subject areas and teachers.

Organization of Elements. Elements of the classroom communication data were examined in larger and larger sequences in this study. The first sequence of elements identified and classified were pairs or diads of elements. Three thousand six hundred and four pairs of elements made up the data sample. Each element was paired with the element preceding it and also the following one. The first and last elements of a topic session were only paired with one other element. The total possible number of distinct ordered pairs of elements with a twelve category system is 12 x 11 or 132 permutations. Of this number only 113 different pairs were actually found in the data sample. The most numerous diads or pairs of elements to appear were made up of an abstract example element and amplification. The second most numerous diad was the pair of elements miscellaneous and abstract examples.

These most prominent pairs naturally affected types of sub-matrix sequences found. These larger sequences included numerous abstract example, amplification and miscellaneous elements.

The largest organization of elements studied was the data matrix of an entire topic or content figure. Each of the fifty-two data matrices in the sample was abstracted into a matrix model display form such as the illustration in Appendix B. The matrix model is developed to show major, secondary, and tertiary category usage as well as the three levels of flow or shift between categories of communication behavior.

Inspection of fifty-two matrix models suggests that content development of a content figure may be simple or complex in structure. A

simple structure is revealed by the use of few elements and few flow patterns. A complex structure is suggested by many categories and flow patterns in the matrix model. Matrix models also seem to be balanced or imbalanced with regard to flow patterns. This balance suggests a much repeated cycle of elements of communication behavior in the topic session.

Findings Related to Teachers. TABLE II is a summary of category usage in classroom time as identified by individual teachers. It was not the purpose of the study to examine characteristics of teachers nor were the communication behaviors of the teacher categorized separately. It can be assumed, however, that the teacher of the session did have a major influence upon the plan for content development and upon the control of communication behaviors in the class. It is also apparent that the teacher sample was incidental and small in number. Given these conditions, it is still interesting to note that some sessions directed by individual teachers do not include naming, concrete examples, personal examples or vividness. In some case Background is much used; in others it is little used. Digression is found a high percent of the time in classes of two teachers, no. 5 and no. 10. Sessions by teachers no. 2 and 3 contain a great deal of miscellaneous behavior while sessions of teachers no. 10 and 12 contain very little. The hypothesis may be proposed that specific characteristics of content development style are related to teacher differences.

Another interesting bit of evidence is found in the two matrix models in Appendix B. These two almost identical models were abstracted from class sessions on different days which were directed by the same teacher. Other models by a single teacher were not as similar. This

TABLE 2

PER CENT OF CATEGORY USAGE IN CONTENT COMMUNICATION

IDENTIFIED BY PARTICIPATING TEACHER

	B	N	D	E	Ea	Ec	Ep	En	A	An	v	M
1	5.0	1.1	.3	8.7	20.2	38.3	.1	.5	4.2	.8	.5	20.2
2	12.1	.1	1.6		28.3	7.5		.9	12.3	6.1		31.1
3	19.4	.5	.5	2.5	29.5			.2	6.6	2.7		38.3
4	3.0	1.5	3.8	2.3	54.6	.1	.1	.6	12.4	3.9	.2	17.6
5	6.9		2.5		50.6	.5			3.9	23.9	.9	10.7
6	11.5	.3	4.4	5.0	48.5				14.1	2.2		14.0
7	10.8	.8	1.7	9.4	25.7	2.5	.8	1.8	21.4	1.8	.1	23.3
8	3.5	.5	2.0	10.0	33.6	11.6	1.3	1.1	10.3	11.6	.1	14.5
9	4.9	.7	1.0	9.8	48.8		.4	1.0	11.8	2.0	.1	19.5
10	12.4	.1	.8		36.0		.5		13.9	28.0	.4	7.9
11	10.9	.4	4.8	4.8	38.2		4.5		10.9	6.2	.1	19.3
12	4.6	1.0	2.5	10.0	15.5	16.7	3.6		33.7	4.1	1.5	6.7
Total for all sessions	8.7	.6	2.3	5.7	35.6	6.6	1.0	.5	13.7	6.8	.3	18.2

evidence may suggest an hypothesis about teacher characteristics and similarity of content development patterns.

Findings Related to Subject Area. TABLE III is a composite of the category usage found in the data sample according to the four subject areas of science, mathematics, social studies, and English. The topics of content found within the data sample are not representative of entire subject areas. Variations in the table are identifiable and may suggest hypotheses about the nature of subject areas and content development.

The Concrete example category was identified far more frequently in science topics than in any other subject area. Miscellaneous category was found more frequently in mathematics. Personal examples and Digression were more frequently identified in social studies topics than in other content areas. Amplification was identified the highest percentage of time in topics of English. These and other variations found in TABLE III may be useful for further study of content development in the classroom.

Patterns of Content Development. Patterns are suggested by usage of a single category, by small sequences of categories, and by entire sequences used to develop a content topic.

The evidence about individual categories in TABLES I, II, and III suggest that content development is largely an exemplifying activity. The combined usage of all types of examples in content development is 49.4 percent. Thirty-five point six percent of all category usage was in the abstract example class. Miscellaneous category makes up 18.3 percent of content communication and is found throughout sequences of topic development. This may suggest that Miscellaneous communication behavior is basic to the structure of the communication process.

TABLE 3

PER CENT OF CATEGORY USAGE IN CONTENT COMMUNICATION

IDENTIFIED BY SUBJECT MATTER AREA

	B	N	D	E	Ea	Ec	Ep	En	A	An	v	M
Mathe-matics	11.4	.4	2.5	4.9	38.1	4.9	.1	.6	10.6	3.3	.0	23.3
Science	6.3	.8	1.6	4.8	29.0	19.0	.8	.4	12.0	9.2	.4	16.1
English	4.7	1.1	2.4	8.7	35.0	6.6		.6	20.5	2.9	.6	15.5
Social Studies	10.7	.4	2.3	4.5	37.7	.3	1.9	.5	12.4	13.2	.3	15.9
For all sessions	8.7	.6	2.3	5.7	35.6	6.6	1.0	.5	13.7	6.8	.3	18.2

The location of an element in the entire topic sequence may also constitute a pattern. Most frequently the Naming element appears very early in the communication sequence and is usually found in combination with Miscellaneous category behaviors. This pattern may suggest the need to identify the topic as an organizer of following communication behaviors. This sequence may also indicate parameters for the relevance of subsequent communication elements. One teacher was observed to name the topic initially in the content sequence and to name the topic again at the close of the sequence. This pattern may imply the use of the Naming element for redundancy and closure.

The use of Naming elements early in the content development sequences and the numerous count of definition elements which follow Naming and Example elements following those definition elements may suggest a generally deductive pattern in content development in this sample. In this rationale Naming would be the most general expression of the topic, defining would be a more specific outlining of the topic and the example would be a specific illustration of the topic.

Little used elements such as Negative example may have much more potential for content development than is evident in the sample. In one instance observed, a teacher of a mathematics class was making an assignment. She named the topic of the assignment, followed this with a discussion of two Abstract examples to illustrate the assignment, and completed the sequence by proposing a Negative example of the assignment and discussing it. Expressed in symbolic logic, this pattern would suggest the communication of an A and not B concept of the assignment.

Another pattern which appears in the sample data is the review or recitation of homework exercises. This sequence pattern is displayed as

the repeated cycle of Miscellaneous elements, Example elements, and Amplification elements with occasional use of Digression elements when a recited exercise is found to be incorrect.

A content topic in an English class concerning the classification of paragraphs of writing into different categories appears in the data sample as General Example elements, the general categories of writing, followed by definitions of each of these categories, followed by specific examples, and concluded with Amplification elements as the specific paragraphs were related to the general categories.

The recording graph in Appendix B displays a sequence of content development which can be summarized by the following sequence: Naming, Concrete example, Background, Concrete example, Personal example, terminat ing with the single elements of Background, Abstract example, Amplification, and Miscellaneous. This pattern of content development is not well explained by known forms of exposition or logic. It is representative of many such patterns displayed by the recording graph which await further investigation and analysis.

Implications

The perspective of this study for the analysis of content development through classroom communication may provide insight about the interrelation of curricular planning, the classroom communication process, and cognitive (5) thinking levels. For instance Background elements in curricular planning represent the prior knowledge related to the topic; in the communication process the Background element may be a context or ground for the content figure; the same Background element may represent recalled or remembered facts by students at the cognitive process level.

In the planning phase, an example may represent a re-structured observation of reality; in the communication phase this example may illustrate the specific meaning of the content figure; the same example may represent the comprehension or application level in cognitive process by students. Likewise Amplification may be thought of as the relatedness and logic in the curricular planning; in the communication phase Amplification may represent the increase in focus and inter-connection of the figure and components; in the cognitive process, Amplification can be classified at the comprehension, analysis, synthesis, and evaluation levels.

The perspective of this study for the analysis of content development through classroom communication may offer potential for further research concerning the organization and sequence of content, and have practical implications for the pre-service and in-service training of teachers.

APPENDIX A

SUMMARY OF CATEGORIES FOR CONTENT ANALYSIS

SUMMARY OF CATEGORIES FOR CONTENT ANALYSIS

NON-CONTENT COMMUNICATION			M - Miscellaneous: All non-content communication. Includes class management, procedure, control, authority, personal, and social-emotional communications.
CONTENT COMMUNICATION	GROUND		B - Background: All classroom communication which develops information or knowledge of the context or frame of reference within which the content idea, topic, or figure is set. This category also includes reference to previously presented subject matter content, that content learned in post class sessions.
	FIGURE	Naming	N - Naming: All communication behavior which identifies or specifies the topic or content figure by name, symbol, or image.
		Defining	D - Defining: Determines the precise significance or meaning of the figure, the idea or concept under consideration. Includes definition of terms used in the concept or figure.
		Examples	E - General Examples: The presentation or development of elements or examples of the figure which are of a very general or construct nature. Such examples deal with the nature of many specific examples. Ea - Abstract Examples: Communication which presents specific examples verbally or symbolically. These have no real or image form as presented. Ec - Concrete Examples: These are specific examples which are presented in a real or image form in communication. Ep - Personal Examples: Examples which have a personal or thematic characteristic. They have an affective quality. En - Negative Examples: Specific examples developed through communication which illustrate what the content figure is not.

(Continued)

CONTENT COMMUNICATION	RELATIONAL	AMPLIFICATION	A - Amplification: Content communication by which an expansion or enlargement of the focus of attention occurs. Two or more things are compared, contrasted, or related. "Why" questions and higher level questions are included in this category.
			An - Digression: Content communication which expands beyond the relevant content figure or background under consideration. This category also includes known incorrect communication behaviors as well as any corrective feedback which might follow such behaviors.
			V - Vivid: Used to denote the quality of content ideation or its presentation which makes its communication emphatic or outstanding. This category also includes verbal or non-verbal directions used to call attention to content ideation.

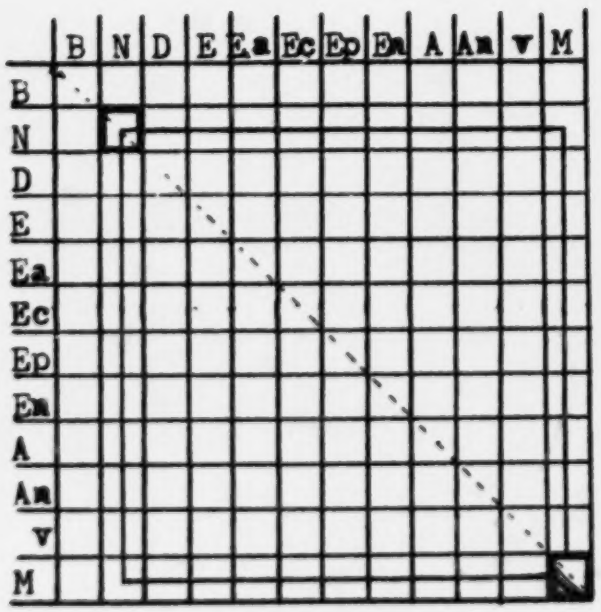
APPENDIX B

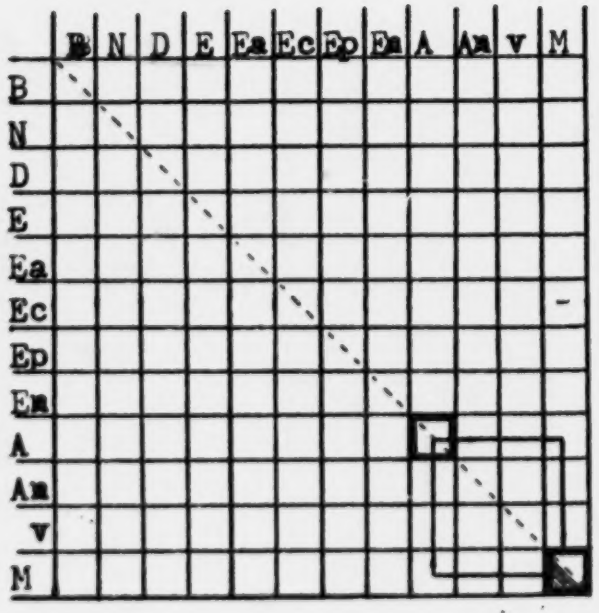
EXAMPLES OF DATA DISPLAY FORMS

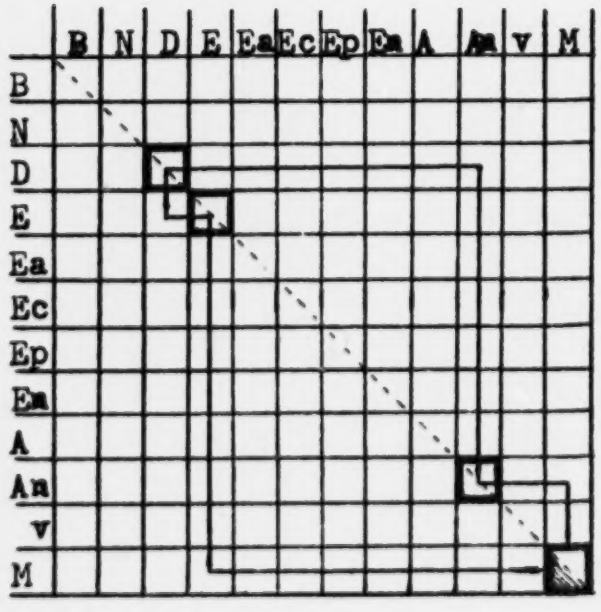
CONTENT ANALYSIS MATRIX

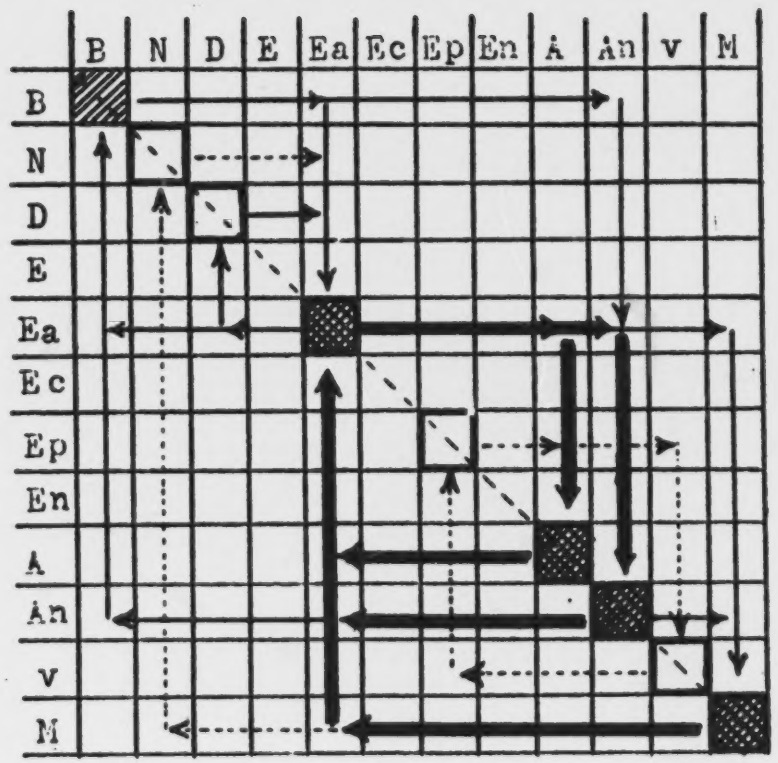
	B	N	D	E	Ea	Ec	Ep	En	A	An	v	M
B	4				2							
N		7			1							1
D			9						2			
E												
Ea	1				153				13	2		18
Ec												
Ep												
En												
A		1	1		11				93			10
An					1				1	19		4
v												
M	1	1	1		19				7	4		11
T	6	9	11		187				114	25		44
%	2	2	3		47				29	6		11

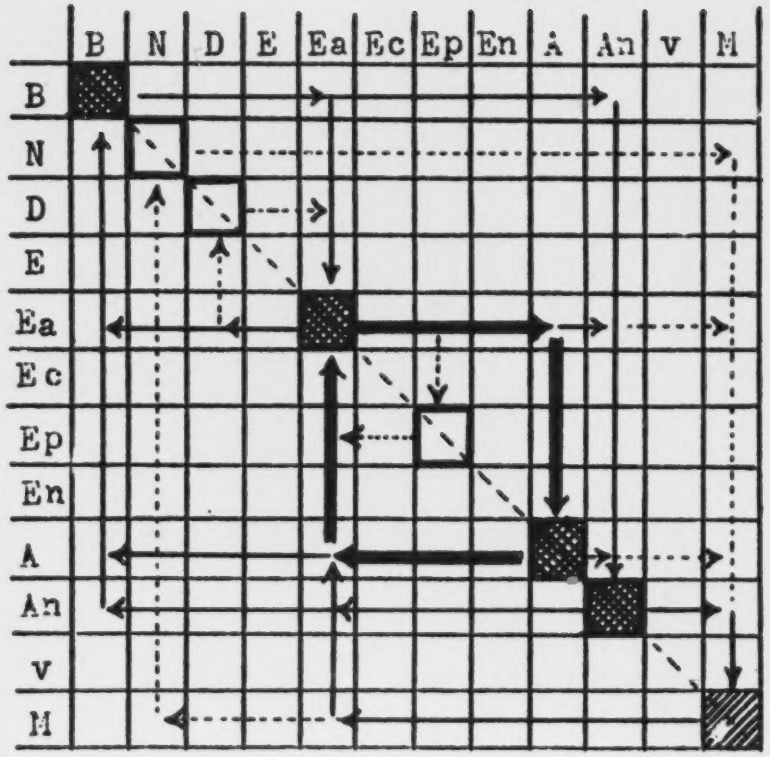
SUB-MATRICES





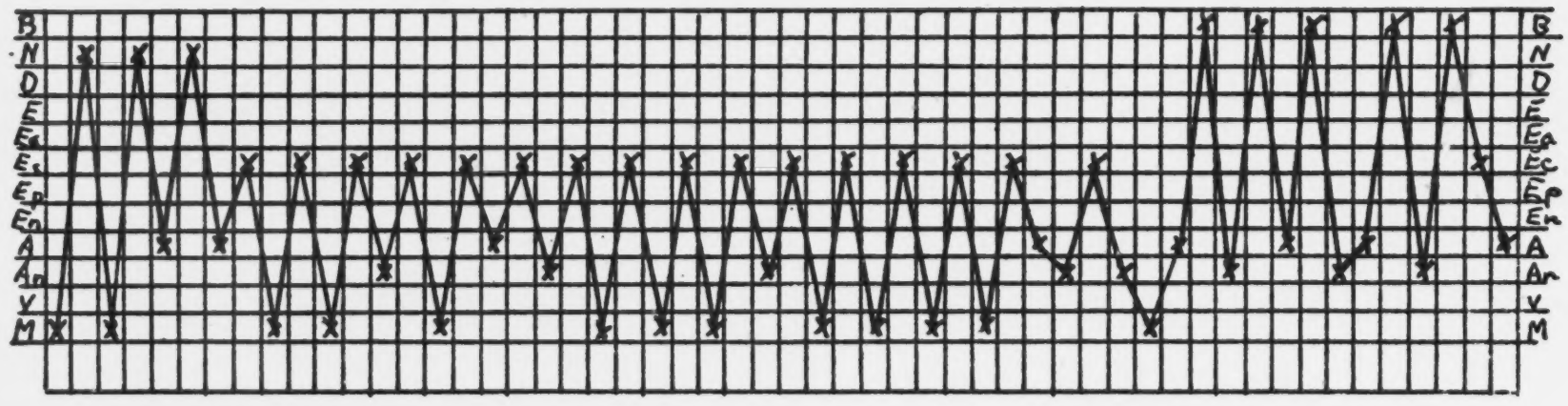


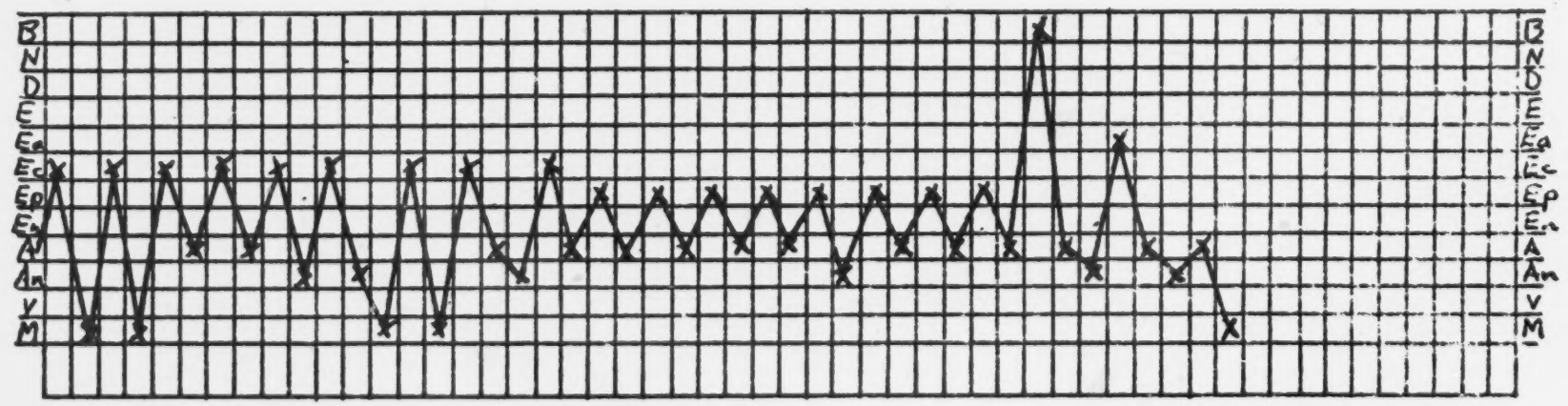




Similarity of content development in different class sessions directed by same teacher.

CONTENT ANALYSIS RECORDING GRAPH





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